Sludge Treatment for Safe Disposal and Recovery*

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Introduction

The increasing volume of sewage sludge produced in Malaysia creates problems in handling and disposal. New approaches in treatment of sludge using thermal techniques and utilization the product are very promising not only in reducing the quantity of waste but also able to produce a valuable by-product for use as construction material. The objective of the study was to investigate the treatment of sewage sludge using high temperature melting to produce a residual material, which is safe for disposal. The study also evaluates the potential use of treated sludge as construction and building material.

Materials and Methods

Sewage sludge collected from septic tanks were characterized for physical and chemical composition. A laboratory scale-melting furnace was used for melting study. The temperature used in the study varied from 900 to 1500°C. Investigations of the physical and chemical properties of finished product were carried out, including hardness, water absorption, specific gravity, chemical composition and leaching.

Results and Discussion

Using incineration and melting, the sewage sludge was converted into inorganic ash and finally as molten slag products which do not generate odour and they are in stable form. The volume of molten slag is about 1.9% of that of the original dewatered cake and about 40 % of that of incinerated ash.

During incineration process, Hg and Pb were the highest vaporizing metals, whereas Al, Fe, Ca, Cr and Cd were stabilized in the bottom ash with a low proportion of evaporation. During melting process, Hg could not be detected in the molten slag due to its highly vaporizing behaviour, Cr, Cd and Pb also were highly vaporized during melting process, whereas Al, Fe and Ca remained stabilized in the molten slag with very low proportion evaporating.

Scanning electron microscopic examination was carried out to examine the microstructure of the different molten slag products. Results show that molten slag with a lower heating temperature above the melting point without holding time and slower cooling rate showed some crystalline boundary structure, whereas the other different melting procedures products were amorphous.

Leaching test conducted for different molten slag found that the leachate concentration were within the standard limit prescibed for many applications.

Molten slag produced from sewage was found to be more superior in quality compared to commercially available crushed stone. It is be better in quality than natural marble and granite.

Conclusions

The sewage sludge can be destroyed using high temperature melting (up to 1550 degree Celsius) to produce useable end product. The physical and chemical properties of molten slag are very superior in quality than many commercially available building materials.

Literature cited in the text

None.

Project Publications in Refereed Journals

Abu Kaddourah, Z., Azni Idris, Noor, M.J.M.M. and Ahmadun, F.R. 2000. Effects of High Temperature Melting on the Porosity and Microstructure of Slags from Domestic Sewage Sludge. *Journal on Water Science Technology.* 41(8): 99-105.

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Ziad Abu-Kaddourah, Azni Bin Idris, Megat Johari, and Fakhru'l Razi. 1999. High Temperature Melting Process For Sewage Sludge, International Conference in Sludge Management, Australia, 8-10 April 1999.

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Graduate Research

None.

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